COST ANALYSIS OF EMS ADVANCED LIFE SUPPORT TRANSPORT SERVICE IN THE CANBY, OR, FIRE DISTRICT

STRATEGIC MANAGEMENT OF CHANGE

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An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

February 2001

ABSTRACT

This research project analyzed actual costs involved in providing public sector advanced life support ambulance services to the Canby, OR, Fire District.

The problem was that the Canby Fire District had not conducted a cost analysis of emergency medical services (EMS) transport provision since it was first offered in 1949.

The purpose of this research project was to conduct an actual cost analysis of EMS transport service delivery in the Canby Fire District.

Descriptive research methods were used to clarify cost allocation to the EMS transport function of the Canby Fire District and to pinpoint related values posed by the research questions.

The research questions addressed were

1. What are the direct and indirect costs of ambulance service operations in the Canby Fire District in fiscal years (FY) 98-99 and 99-00?
2. What is the cost per unit hour for ambulance transport services?
3. What were the actual transport costs in FY 98-99 and 99-00?

The procedure began with a literature review of recent cost allocation processes used by EMS transport providers. After choosing the most appropriate model, authors of the selected model were interviewed to fine-tune the best-cost analysis project for fire district. Data was collected and applied to the appropriate cost analysis templates to address the research questions.

The results of this research included the identification of the fire district FY 98-00 direct and indirect cost centers, the actual cost per unit hour for ambulance services and actual ambulance transport costs for the fire district in fiscal years 98-99 and 99-00. Tables were produced that answered all of the research questions. The research led to resolution by the fire district elected officials to revise ambulance rates.

Recommendations included improvements in the areas of data collection and retrieval, annual review and updating of the cost analysis using the most current “Actual Expenditure” budget figures, and using the cost analysis document for various future service projections.

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INTRODUCTION

> Fire agency managers have bona fide reasons for knowing the costs of various activities. As fire service management techniques have become more and more reliant on the use of data, fire agencies have increasing responsibility to their constituents to provide valid, reliable, nationally tested information. With the right tools, fire agencies can: make direct financial comparisons between public and private service providers; Set fair, reasonable and competitive prices for services provided; Evaluate the performance of fire agency programs based on costs and benefits to the community; Perform comparisons with other agencies of comparable size and circumstance that apply the same model; Communicate more effectively with public officials and customers. (Goebel, Gorman, Jensen, 1997, p. 37)

The problem is that the Canby, OR, Fire District has not ever conducted a cost analysis of EMS transport services.

The purpose of this project is to conduct an actual cost analysis of EMS transport provision in the Canby Fire District.

The research methodology used is descriptive to address three research questions:

1. What are the direct and indirect costs of ambulance service operations in the Canby Fire District in fiscal years (FY) 98-99 and 99-00?
2. What is the cost per unit hour for ambulance transport services?
3. What were the actual transport costs in FY 98-99 and 99-00?

BACKGROUND AND SIGNIFICANCE

"The Canby Volunteer Fire Department began a transporting ambulance service for the City of Canby and the Canby Fire District in June of 1949." (NFA, 1999, p. 36) The first ambulance was purchased with community donations and there was no charge, although donations to continue the service were accepted. This practice continued for approximately 20 years. As costs of vehicles, supplies and advanced training of emergency medical technicians exceeded the means of the department the decision was made to charge for the service. The rates were determined arbitrarily by charging a rate somewhat less than the closest private transport service provider and offering an additional discount to Canby city and fire district residents. Over the past 30 plus years the rates have been raised occasionally only because the private agencies had increased their rates.

In the late 1980's, Clackamas County government (the Canby Fire District encompasses 53 square miles in the southwestern corner of Clackamas County) was required by state law to establish an ambulance service area (ASA) plan. In the plan the Canby Fire District and, our southeastern neighbors, the Molalla Fire District were awarded their own ASAs and not required to bid or adhere to any contract. The balance of the county was designated as a single ASA and is serviced by a contractor. The current contractor for the "Clackamas County ASA" is American Medical Response (AMR). Recently there has been some dialogue from the private sector providers as to the unfairness of being held to contract standards when the two remaining ASAs are not. This presents a very real issue of having to bid on our own ASA to continue service in the future.

To date no fire district nor city officials have attempted to solve the problem of cost allocation or determination of actual transport service provision costs. As the manager of EMS in the Canby Fire District, this researcher felt that it was extremely important to have knowledge of this information for a number of reasons. The Executive Fire Officer should also apply the following reasons to each of the programs they manage, as cited by EMS Best Practices:

> First, cost allocation helps you manage your resources and work flow. It tells you what you are spending on the provision of which service, and allows you to compare your costs for that service. . . . Identifying your costs offers useful information for cost control. . . . Knowing how much you spend helps you set prices that reflect the true cost of doing business. . . . Knowing your costs can be used in contract bidding and negotiations. (EMS, 1998, p. 12)

The absence of the true cost impact to the fire district in the area of ambulance transport services made it difficult, if not impossible to measure compliance with the initial point in the Canby Fire District mission statement, that is ". . . to provide effective emergency medical services to the community." (CFD, 1997, p. ii)

This project embodies two separate areas of relevance to the Strategic Management of Change (SMOC) curriculum. In Module 1: Introduction to Change Management, on the issue of current issues and trends:

> The economic facets of operating a business in the private sector are becoming increasingly important in the public sector. Government

> agencies, who [sic] had been somewhat immune from having to show a profit, are faced with the mandate of doing “more with less” and doing it better and faster. (NFA, 1996, p. 1-5)

In SMOC Module 4 – Leading Change Using the Change Management Model, under the Leading Change sections states: “Leading change involves breaking out of the box of tradition that constrains an organization and shifting the paradigm away from business as usual.” (NFA, 1996, p. 4-4)

Through processes outlined extensively in subsequent sections of this research project, this researcher sincerely believes that resultant information will allow us to deliver even more timely, efficient and cost effective services to our customers.

LITERATURE REVIEW

A literature review was undertaken to provide information in three distinct areas. First, there was a review of fire service and private sector literature to determine existing methods of allocating direct and indirect fire and EMS services costs. Second, information was researched in order to determine proven and accepted procedures for assessing hourly costs of providing EMS standby services, not related to emergency response. Finally a search of available information was conducted to accurately calculate the actual cost to the fire district of providing ambulance transport services. The literature review involved a search of fire service and accounting trade journals, magazines, and textbooks. In addition published system cost templates were identified in National Fire Academy (NFA) applied research projects and experts in the field of costing out

fire service EMS were interviewed. Sources pertinent to the solution of the research questions found in the review of literature are summarized in this section.

Cost Allocation

According to Fitch, Keller, Raynor and Zalar (1993), the basis for the cost of providing a service should be based on the actual cost of delivering goods and services ". . . and EMS should be no different." (Fitch, Keller, Raynor, Zalar, 1993, p. 280)

Two fire service EMS providers who chose to allocate the costs of doing business were found in the literature review.

The Cushing, Oklahoma Fire Department (1996) decided to look at its costs in providing BLS transport to the city of 7,500 residents. They divided the cost of operating their transport service for the prior three years by the number of patient service runs. "We found that the average cost per patient service run was approximately $400." (EMS, 1998, p.12)

Seminole County, Florida's, fire chief reported on a process his department undertook in 1997. The department was considering the addition of transport services by competing with a private EMS transport provider. The department is an agency that provides many different types of emergency services, not unlike most other fire and EMS providers. Several questions arose, over the two-year study, as to what it cost to deliver EMS services. "While the Division budget is public record, most questions centered on what proportion was allocated to the EMS function." (Schenk, 1997, p.3)

A Unites States National Highway Traffic Safety Administration report, (1996) suggests that the cost of EMS for any geographical area includes the costs of the “infrastructure and activities” needed to deliver the EMS services. This would include all activities that contribute to EMS costs, i.e. communications, vehicle and equipment purchase and maintenance, personnel training, continuing education, first response AND ambulance transport services, medical direction, licensing and regulation fees, etc. (NHTSA, 1996, p. 21)

Alec Jensen and Jack Krakeel (2000) agree that although there are numerous and widely varying approaches to cost allocation, two basic methods exist: “. . . incremental (also called marginal costing) and full costing (sometimes called activity-based costing).” They contend that the incremental method recognizes existing employees and infrastructure and should be applied in instances where decisions need to made on the issue of whether to “. . . take on new work or add services.” The full costing method, which is much more detailed than the incremental style, distinguishes between costs of providing existing services and a proposed new service. (Jensen and Krakeel, 2000, p. 30)

In 1995 the American Ambulance Association and its contractors produced an EMS System Cost Template. As part of the template, Professor Charles T. Horngren (1995), offered an several cost accounting terms and an assessment of relevant EMS analysis costs:

> “Direct Cost – A cost that can be specifically traced to a particular service product.

Indirect Cost – A cost that cannot be specifically traced to a particular service or product. …

Full Cost – The total direct and indirect costs of an activity.

Partial Cost – The cost of an activity that is less than its full cost." (Horngren, 1995, p. 2)

Professor Horngren (1995), relates that the role of cost accounting is "to provide relevant data for decision models" and for other management guidance tools. (Horngren, 1995, p. 2)

The decision to either contract out a new service or to buy out and/or construct the new service is one that plaques many public and private sector organizations. For example, should a fire district continue to contract-out private sector ambulance services or is it more cost effective to provide the service with existing or newly acquired personnel and equipment.

> There are some general principles for deciding the cost items to be included and measured in a make-or-buy analysis. The primary general principle is that the longer the time period involved, the more cost items that are relevant. Many respected authorities on cost analysis have espoused this basic point; in fact, this point is the crux of clear thinking in make-or-buy situations. (Horngren, 1995, p. 2)

> Professor Horngren (1995), states that the decision to make-or-buy a service should be based on sound and well respected economic principles. "The primary general principle is that the longer the time period

> involved, the more cost items are relevant . . . this point is the crux of clear thinking in make-or-buy decisions." (Horngren, 1995, p. 2)
>
> Robert Dixon (1953), supports Horngren's point. He states that if an agency or organization is contemplating a temporary service, that only the direct costs need to be considered. However, if a prolonged or more permanent service is being considered, all relevant direct and indirect costs, "including administrative overhead" should be properly allocated to that particular new portion of the organization. (Dixon, 1953, p. 55)

Utilization Cost Per Hour

Due to uses of the ambulances in the Canby Fire District for EMS standby services, it was important for the district to determine a stand-alone cost per unit hour for the use of a transport unit and crew not including an actual transport. Research question two addresses the issue of cost per unit hour.

The American Ambulance Association (AAA) identifies several financial performance measures in the process of costing out transport services which include: response costs, cost per unit hour, productivity, total system cost per capita, local tax subsidy per capita and subsidy/price trade off analysis. (AAA, 1994, p. 16)

In a document supporting the AAA position, Auerbach (1995), also espouses the inclusion of all costs (direct and indirect) to ensure "consistent application of performance measures." He indicates that municipalities may fail to include costs of providing a service under the assumption that existing

personnel and equipment can provide additional services for the same cost. (Auerbach, 1995, p. 6)

An International Association of Fire Fighters (IAFF) publication (1995), contrasted the AAA's method of activity utilization to their own. The IAFF contends that the AAA calculates cost per call by dividing total expenses by total patients transported. They also state that the AAA arrives at unit hour cost by dividing total expenses by the total hours that ambulances are in operation. The IAFF model of "utilization activity" is based solely on the in-service time. "That is, the time from dispatch through call termination divided by the amount of time the unit is in operation." (IAFF, 1995, p. 21-22)

A third view combines attributes of both the IAFF and AAA models. According to Alec Jensen, the stand-alone cost per unit hour calculation for standby activities is straightforward and simple and not widely disputed by public and private providers. "Using the basic LJG cost allocation process one needs to define the activity, determine the time and resources needed to do the activity, determine all direct district costs in providing the activity, and assign any allocated costs to arrive at the full cost of providing the activity." (Jensen, A., personal communication, October 5, 2000)

Costing Out EMS Transport Services

The three major sources of literature found addressing this research question were the American Ambulance Association's Andersen Model, the International Association of Fire Fighters, and the International Association of Fire Chiefs sponsored LJG Cost Allocation Model.

Professor Charles T. Horngren (1995), a proponent of the AAA model, suggests that partial cost allocation is appropriate only if the organization is providing such service on a temporary basis. However, if the organization is considering a more permanent provision of such services, he contends that "the added paramedic transport activities tap all of the fire department's resources." He alludes that many public sector cost allocation models do not include all of the resources that exist to produce and deliver public services. Professor Horngren's view is that the AAA's Anderson Model includes all of the costs that are incurred in the provision of paramedic ambulance services. "I conclude that it is a reasonable and appropriate model for analyzing this EMS issue." (Horngren, 1995, p. 5)

Forwarding the second viewpoint on cost allocation, the IAFF espouses, in the *Guide Book For Fire-Based Systems*: 'When comparing fire-based EMS systems with private systems, it is essential that appropriate costs be used. . . . only the **marginal costs** of the service should be used. The marginal costs . . . are only those expenses **beyond** what it would cost for other routine fire department operations." (IAFF, 1995, *Emergency,* p. 21)

The IAFF further offers the standing army point of view in the above quoted publication. In essence, since many of the administrative and personnel costs are already being spent for fire suppression and rescue services, and since many departments already provide first response advanced life support services, the cost of providing the additional transport service would be minimal. "This

makes fire based EMS systems particularly cost effective." (IAFF, 1995, *Emergency,* p. 21)

The third source of cost accounting for EMS services identified in the literature search was the LJG model (for Lazar, Jensen, Goebel). This model is outlined in detail in the May 1997 *Fire Chief* magazine, and appears to be a combination of the previous ones.

The LJG model takes into account the multitude of services and activities that are provided by today's modern fire services, as opposed to the private sector model, which often provides one or two services. The LJG model also focuses on the important inclusion of all related costs, both direct and indirect. "The method, when properly applied, precisely identifies, assigns and allocates all costs for each activity ("full cost"), as well as the added cost of a new service or activity ("marginal cost")." (Goebel et al., 1997, p. 38)

The LJG model provides the fire service manager with sufficient tools to make informed judgements on which entity should provide a particular service and in addition, the price to be charged for the service. The cost allocation processes offered by the LJG model uses a step by step approach that: defines each activity provide to customers, determines the time and resources required to perform the various activities, identifies, assigns and allocates cost based on existing and proposed services, and arrives at both full and marginal costs for providing each service. (Goebel et al, 1997, p. 38)

An article in *EMS Best Practices* (1998), provides a comparison of the

> AAA, IAFF and LJG models. Best practices states that "the model developed by Goebel (LJG) reflects the total cost of providing EMS services, and advocates that price reflect total cost." The IAFF method is very similar to the LJG model although it advocates only marginal costs as opposed to total costs. The AAA model is also a total cost analysis however the actual allocation of costs are computed differently than in the other two models. (EMS, 1998, p. 12)

The AAA model did not seem to be an appropriate method primarily because this researcher's fire district performs several services, not just a singular function as most private sector EMS providers in this region do.

Conversely, the IAFF model appeared inadequate for the needs of this researcher's fire district. The IAFF model did not seem to fairly allocate EMS transport costs in a format that could be compared in an apples-to-apples comparison with competing organizations. The LJG model impressed this researcher for several reasons. The methodology appears to be a fair compromise between the AAA and IAFF extremes, which on the surface, appears to be interest motivated. The LJG total and marginal cost allocation meld took into account the public sector's "standing army" argument as well as the concept that EMS providers should ". . . burden the users with a majority of the expense of doing business."(Jensen, A., personal communication, October 5, 2000)

The LJG model has been adopted by the IAFC who sponsor workshops in its use. Currently the LJG method of cost allocation can be contracted through the Emergency Services Consulting Group (ESCG) in Oregon. Two of ESCG's consultants (both cited as references in this project) are local fire service

executives who coincidentally were previously employed in private sector upper management. Two consultants who know how the private sector thrives on the acquisitions of poorly managed EMS providers.

PROCEDURES

This research project engaged descriptive methodologies to identify direct and indirect district EMS costs, from Canby Fire District cost centers, in the areas of cost per unit hour and actual medical transport costs for fiscal years 98-99 and 99-00.

A literature search was initiated at the National Fire Academy's Learning Resource Center in September 2000 while attending the EFOP SMOC class. Additional literature searches were conducted via the Internet, the Northwest Association of Fire Trainers library, and the Woodburn Ambulance Company library.

After reviewing available literature and case studies outlining several cost allocation analyses, the best one for our experience was chosen. In addition the types of emergency response (EMS transport responses, first response, and fire & other responses) to be evaluated for distribution purposes were chosen.

Personal interviews were conducted with cost allocation experts to clarify points made in the published material.

In order to answer the first research question, to identify direct and indirect costs of ambulance operations, the following procedures were undertaken:

Since the cost allocation process is data intensive, it is imperative that either the researcher have good databases and data retrieval systems or else allow enough time to build a database necessary to complete the project.

Data required for allocation distribution percentage computation (Table One) and sources are as listed.

Response history (for each type chosen)	-	OAIRS (NFIRS) data
Training hours (all training activities)	-	Department records
Public Education Activity hours	-	Department records
Fire Prevention Activity hours	-	Inspection records

It is extremely important that the data include exact time-on-task information. For example, when using dispatch or NFIRS type data for determining response hours on ambulance transports, one must be able to document alert time to available-for-next-call time on every transport. The same time-on-task information must be available for all other activities performed by personnel (training, public education, fire alarms, etc.).

Once all activity hours are accounted for, distribution percentages are computed for direct and (separate percentage) indirect costs that will be needed in applying budget expenditures for the cost allocation procedure.

It should be noted that the reason for the different percentage allocation values for direct and indirect costs is due to the concept of “activity based allocation.” (Gorman, K., personal communication, February 14, 2001) According to Kyle Gorman (1997), co-author of a *Fire Chief* magazine article on costing out fire EMS, “even apparently direct costs of emergency medical services can

usually be allocated between your ambulance transport and first response functions." (Gorman, K., personal communication, February 14, 2001) Indirect costs therefore should be spread out incrementally over all identified fire service functions, hence the two completely different sets of allocation percentage values.

Most of the data required for the following computations were gleaned from the "actual expenditure" columns of the FY 98-99 and FY 99-00 found in the FY 00-01budget document. However, other sources of information include fuel records, vehicle maintenance schedules and repair records (from fleet maintenance contractor), depreciation values from annual audit records, and personnel expenses from the human resources section.

Data required for direct cost allocation of EMS transport and first response provision (Table Two) and possible sources are listed below:

EMS medical supplies	-	actual budget expenditures
Physician services	-	actual budget expenditures
EMS coordinator / billing staff	-	actual budget expenditures
EMS training / schools / travel	-	actual budget expenditures
EMS equipment	-	actual budget expenditures
EMS vehicle / Capital deprec.	-	book depreciation
EMS capital outlay	-	actual budget expenditures
EMS equipment reserve fund	-	actual budget expenditures

Data required for indirect cost allocation of EMS transport and first response provision (Table Three) and possible sources are listed below:

Board of Director expenses	-	actual budget expenditures
Management staff salaries	-	actual budget expenditures
Line staff salaries	-	actual budget expenditures
Insurance/retirement expenses	-	actual budget expenditures
Materials and services	-	actual budget expenditures
Facilities depreciation	-	book depreciation
Staff vehicle depreciation (other)	-	book depreciation
Equipment maint. /fuel	-	actual budget expenditures
Dispatch services	-	actual budget expenditures

Research question number two sought to pinpoint the cost per unit hour of ambulance transport services? The knowledge of this value was important to the fire district primarily for use in fixing “standby” rate structures. Frequently the fire district is contacted to perform BLS, ILS and ALS ambulance stand-bys at rodeos, high school sports contests, racing events, company picnics, etc. The ambulance cost per unit hour (Table Four) was calculated simply by dividing annual ambulance vehicle expenses (fuel, maintenance and repair, insurance costs, book depreciation) from previously identified sources by the number of operation hours per year (found on daily vehicle checkout records). Due to the constant of ambulance fleet profiles (new purchased units placed in-service and older units being surplused), an average cost per unit hour over two fiscal years was a more accurate reflection of actual costs. The average cost/unit hour was then applied to current volunteer personnel reimbursement rates for advanced, intermediate and basic life support crews (EMT certifications for each level of

service is mandated by the Oregon Administrative Rules for the Oregon Health Division – EMS section). Volunteer crew costs were applied in Table Four because only they perform these functions in the district.

The answer to applied research question number three can be found on Table Five. The calculation divided EMS transport total allocated direct and indirect expenditures (found on Tables Two and Three) by the number of total transports (from fire district ambulance billing records).

Definition of Terms

"Cost Allocation - An accounting method … which identifies how much money is being spent to provide a particular product or service." (EMS, 1998, p. 12)

"Cost Centers - Functional areas of your organization to which you can assign direct costs (Becknell 1998, p.13)."

"Direct Cost - A cost that can be specifically traced to a particular service or product." (Horngren, 1995, p. 1)

"Indirect Cost - A cost that cannot be specifically traced to a particular service or product." (Horngren, 1995, p. 1)

"Fixed Cost - A cost that for a given period of time and range of activity does not change in total." (Horngren, 1995, p. 2)

"Full Cost - The total direct and indirect costs of an activity." (Horngren, 1995, p. 2)

"Marginal Cost Analysis - Determining the additional costs of providing a particular service, over and above an organization's existing costs." (EMS, 1998, p. 13)

"Total Cost Analysis - Dividing all of an organization's cost 'pie' into the various services that the organization provides." (EMS, 1998, p. 13)

"Variable Cost - A cost that fluctuates in total in direct proportion to changes in total activity or volume." (Horngren, 1995, p. 2)

Assumptions and Limitations

Procedurally, three basic concepts were assumed in the research.

It was assumed that the authors and organizations cited in the literature review performed sound and unbiased research.

In addition, it was assumed that all of the Canby Fire District data, documents and records were accurate.

Finally, it was also assumed that all data and values obtained from State of Oregon agencies and outside contractors were current and true accountings of district activities.

Limitations were encountered during the course of this research project, including time constraints, data collection problems, constantly changing budget values and availability of some of the materials cited in the literature review.

Due to the six-month time limit required for applied research project completion, there was not sufficient time to rebuild or redesign some of the data

collection problems encountered during the project. This limitation required the use of pre-existing data retrieval systems that took more time than expected.

Because of the constant and changing landscape of many of the cost centers identified in the project (ambulance fleet profiles, labor agreements, fuel prices, labor force make-up, number of ambulance transports per annum, etc.) it was difficult to determine exact results. For example, on Table Four, Medic 62 values in FY 98-99 are missing because that particular ambulance was purchased and placed into service in the last quarter of that fiscal year. In such cases, where information was not obtainable or non-existent, values were averaged with other fiscal years.

One last limitation was a minor one, but may be significant for some public sector agencies attempting to reproduce the research outlined previously in this project. The American Ambulance Association materials are not readily available. The templates and publications can be obtained by members for a reasonable price but for non-members are exorbitant. This author was fortunate in obtaining the cited materials from a neighboring private sector provider but may be a formidable task for those attempting to duplicate this research without such a source.

RESULTS

All three of the research questions were answered through processes and formulae chosen from options identified in the literature review.

1. **What are the direct and indirect costs of ambulance service operations in the Canby Fire District in fiscal years (FY) 98-99 and 99-00?**

The first step taken to solve the query in the first research question was to identify the general categories of necessary to allocate costs associated with the delivery of emergency services. Since the thrust of the research project dealt with emergency medical transport, it was necessary to differentiate between transport services and first response services (those EMS responses that did not result in patient transport). All other responses were lumped into a “Fire & Other” category. (See Table One) The latter category was of no importance to this project and was identified only to allocate the balance of non-EMS expenditures. The “Fire & Other” values will not be addressed further.

Next the general areas of fire district activity were researched. Those areas were emergency responses found in the Oregon All Incident Reporting System (OAIRS), an NFIRS type database, training activities, public education projects and fire prevention activities. From the reported hours documented in each activity a distribution was identified for transport services (32% in FY 98-99 and 30% in FY 99-00), first response services (13% in FY 98-99 and 17% in 99-00) and fire and other services (55% in FY 98-99 and 53% in FY 99-00). The distribution values were applied to indirect costs for allocation purposes. For direct cost allocation, it was necessary to assign distribution percentages in the area of EMS services only, i.e. EMS transport, (91% in FY 98-99, 77% in FY 99-00) and first response activities (9% in FY 98-99, 23% in FY 99-00).

Research question #1 could then be answered by applying now known EMS transport distribution percentages for both the direct and indirect costs. Table Two shows that EMS direct costs were $259,545.73 in FY 98-99 and $236,496.26 in FY 99-00. The indirect costs on Table Three were $367,177.47 in FY 98-99 and $431,372.40 in FY 99-00.

2. What is the cost per unit hour for ambulance transport services?

The calculation of this value was very simple and quite easily acquired with the data previously accumulated in the project.

Cost per unit hour for the vehicle was the sum of vehicle costs (fuel, maintenance, vehicle insurance costs and book depreciation) divided by the number of hours the vehicle logged in each fiscal year. (See Table Four) Due to the district's use of one "first out" ambulance on most medical responses and because the older units required more maintenance than newer ones, it was arbitrarily decided to average the cost per unit hour of all three of our ambulances to arrive at a more accurate value.

By combining the hourly reimbursement rates for pertinent crew profiles with the vehicular cost per unit hour, Table Five illustrates that in FY 99-00 a BLS ambulance stand-by cost the fire district $97.01/hr.

3. What were the actual transport costs in FY 98-99 and 99-00?

Again, as in research question two, the potential researcher is rewarded for the arduous and meticulous efforts encountered in the data retrieval process required achieve the solution in the first question.

The formula used in Table Five to identify actual transport costs is X = A / B, where A is the total EMS transport (direct and indirect) costs, B is the total number of transports and X is the cost per EMS transport.

In FY 98-99 the average cost per EMS transport were $1202.92 and $1007.34 the following fiscal year.

DISCUSSION

The Canby, OR, Fire District realized, after 50 years of operating a transport ambulance service, either dependent upon donations or arbitrarily set ambulance rates that change was in order. Some of the changes, i.e. Medicare billing formats, State of Oregon EMS administrative rules and county regulations were externally mandated and not an issue with this research. Relevant changes to this project included the identification of EMS transport cost centers and ambulance transport/stand-by rates adjustments to more accurately reflect true cost.

Several models to achieve the desired results were researched and evaluated for the highest degree of accuracy in determining true costs. The method used most closely resembles the LJG model that allocates costs based on EMS; first response and other fire related activities.

It is this researcher's conclusion that the results were fairly close to expectations. The fire district, charging an average transport bill of $700 (in FY 98-99 and 99-00) per transport was significantly less than actual costs of over $1000 per transport. Other departments identified in the literature discovered the same disparity. Cushing, OK, Fire Department's Carol Dennis states, "We found

that the average cost per patient service run was approximately $400." (EMS, 1998, p. 12) The Cushing Fire Department raised their base ambulance service rates from $95 to $400 in 1997 "its billing more than tripled … collections more than doubled…" (EMS, 1998, p. 12)

In 1997, the Seminole County (FL) Department of Public Safety also benefited from our chosen model "utilizing the LJG methodology to accurately measure our costs." (Schenk, 1997, p.4) Their study, as quoted in the Deloitte & Touche, LLP *Emergency Medical Services Cost Analysis* concluded "based upon the budget data for the fiscal year ending 1997 and the reported service activity of the Fire Department, the current … average cost per call for (EMS) service of $420.06." (Schenk, 1997, p.6)

The literature review also found that large urban fire departments used similar techniques in streamlining their operations. "In the San Jose (CA) experience, the City engaged the EMS consulting firm, Emergency Care Information Center (ECIC), to conduct an analysis and make recommendations regarding the structure and delivery of prehospital emergency medical care within the City." (IAFF, 1995, *Effectiveness*, p. 26)

Although other EMS provision agencies have obtained similar results of cost accounting as we have, there were some differences.

Cushing, OK, found that they were charging only 24% of their true costs for transport services. Our experience was closer to 30% of true costs. Without the knowledge of how the Cushing rates were originally set, it is impossible to make a comparison to the difference. However, the researcher believes that our

arbitrary process of adjusting rates to the nearest private providers rates were somewhat accurate. This researcher believes that cost differences between what this project revealed and what the closest private provider charges can be attributed to several factors. The Canby Fire District uses more costly type III ambulance units than the private provider's type II units. Our transport units are staffed with two paramedics while the county ambulance service contract requires only a paramedic and an EMT-Basic on their transporting ambulances. The most significant difference, however is that all of the private provider's line personnel are encumbered to do one task, that is to provide prehospital medical transport services. Our personnel are dual-roled, cross-trained firefighter / EMT-Paramedics who perform several other duties. This "standing army" concept has been previously argued from many different standpoints. The fact in Canby is that frequently prehospital transport personnel have been engaged in other fire district functions or duties when calls for service have been received. This has caused the dispatch agency to turn calls over to other adjoining service providers. The loss of potential revenue, due to turned over calls, along with the higher levels of equipment and personnel provision increases the cost per call significantly. This increases level of service continues to be endorsed by the local medical community as well as the fire district voters and taxpayers.

The positive organizational implications of this project are many. Although all of the positive aspects may not have been as yet realized, some of the more apparent ones are:

- Solid identification of all of the cost centers that affect EMS services;

- Increased efficiency in collection and retrieval of pertinent data;
- Ability to make direct financial comparisons between public and potentially competing private ambulance service providers;
- Set fair and equitable ambulance rates that more accurately reflect the cost of service provision; and
- Provision of a revisable document that elected officials and management can use for justification of rates and service provision levels, which is a “body of knowledge” that has never existed.

A number of changes have been initiated in the Canby Fire District as a direct result of information found in this applied research project. Due to problems encountered in vehicle cost data retrieval, a more efficient method of encoding fuel pump transactions has been initiated. In addition, to more accurately account for vehicle maintenance and repairs, a unique vehicle identification system has been developed and is now in use. The unique vehicle number stays with the vehicle when it is pressed into different service areas an its unit number changes. A Board of Directors resolution increased the Canby Fire District ambulance transport and stand-by rates. (Appendix B) Also, to align with Medicare and other insurance providers billing requirements, our ambulance billing structure has been changed from an itemized format to an all-inclusive type bill.

RECOMMENDATIONS

It is strongly recommended that the Canby Fire District:

1. Update all of the information in the tables of this project as soon as annual audit statistics are made available?

This is necessary to have the most accurate and real-time reflection of the "state-of-the-service" for use by elected officials and managers of the organization. Specifically the updated information can enhance rate, staffing, contract negotiations, community presentations, etc.

2. Create a reporting format to document staff hours spent on district functions, i.e. fire prevention activities, hydrant maintenance, mapping projects, and public education activities.

Exact District activity hours were easily obtainable, through dispatch, training and other records with the exception of the activities above. A more accurate cost allocation process could be realized with exact, instead of estimated, data.

3. Adjust ambulance transport and stand-by rates (positively or negatively) when significant shifts or trends become apparent through the evaluation processes.

This researcher believes that charges for EMS services should be a flexible value and one that is based upon current costs, not costs incurred several years earlier. An example of annual changes (that can happen suddenly)

have occurred in this fiscal year (FY 00-01). Fuel and energy costs have risen significantly as well as the addition of one drug in our EMS arsenal (Amiodarone) which costs approximately $200/dose.

It is recommended that future research by this District or others attempting to obtain true service costs, research the most current methods and options available. The reasoning for this is as the current body of knowledge in this area expands and as information technologies improve, better models, possibly on software, will emerge for use.

REFERENCES

American Ambulance Association (AAA). (August, 1994). *Contracting for Emergency Ambulance Services: A Guide to Effective System Design*. San Francisco, CA: Arthur Andersen & Co. SC.

Auerbach, P. (1995). American Ambulance Association: An Emergency Medical Services (EMS) Systems Primer. San Francisco, CA: Arthur Andersen & Co. SC.

CFD (1997). Mission Statement. Unpublished and archived organizational documents. Canby, OR.

Dixon, R. (1953). Creep. *Journal of Accountancy*, 4, 55.

EMS Best Practices. (1998, July)). Cost Allocation: An Accounting Methodology to Help You Manage Your Resources. Ostrow, L. S.

Fitch, J. J., Keller, R. A., Raynor, D., Zalar, C. (1993). *EMS Management Beyond the Street, Second Edition*. Carlsbad, CA: Jems Communications.

Goebel, R.C., Gorman, K., Jensen, A.M. (1997). Costing out fire EMS: A level playing field. *Fire Chief.*

Horngren, C. T. (1995). American Ambulance Association: Cost Analysis of Arthur Andersen Paramedic Transport Cost Model. San Francisco, CA.

IAFF (1995). *Effectiveness of Fire-Based EMS*. Washington, D.C.: International Association of Fire Fighters.

IAFF (1995). *Emergency Medical Services: A Guide Book For Fire-Based Systems*. Washington, D.C.: International Association of Fire Fighters.

Jensen, A., Krakeel, J. (2000). Full Costing Can Sway Policy-Makers and Help Set User Fees. *Fire Economics.*

National Fire Academy (NFA) (1999). *Development of Emergency Medical Services in Canby, OR, and Environs: A Historical Perspective.* Emmitsburg, MD: Laird, W.R.

National Fire Academy (NFA) (1996). *Strategic Management of Change: Student Manual*. Emmitsburg, MD.

National Highway Traffic Safety Administration (NHTSA). (1996). *Emergency Medical Services - Agenda For The Future*. (DOT Publication No. HS 808 441). Washington, D.C.:, U.S. Government Printing Office.

Schenk, T. L. (1997, August). *Making the Fire Service Competitive in EMS - Is the Fire Chief ready to fight?: The Seminole County, Florida Experience.* Paper presented at the meeting of the Fire/Rescue International 1997 Conference, Dallas, TX.

Appendix:

Tables

TABLE ONE

DISTRIBUTION OF RESPONSE HOURS BY TYPE

Description	Total Hrs.	Transport Hrs.	1st Response Hrs.	Fire & Other
FY 98-99				
OAIRS Hours	1375.10	1101.07	112.75	161.28
Documented Trng Hrs	1239.50	223.25	223.25	793.00
Public Ed. Hrs	1300.00	325.00	325.00	650.00
Fire Prev. Activity Hrs	1300.00	0.00	0.00	1300.00
Reported Hr Subtotal	5214.60	1649.32	661.00	2904.28
% Distribution	100	32	13	55
% Distribution by EMS Type Hours Only		91	9	N/A
FY 99-00				
OAIRS Hours	1642.38	1049.75	310.21	2938.42
Documented Trng Hrs	1269.00	281.50	281.50	706.00
Public Ed. Hrs	1300.00	325.00	325.00	650.00
Fire Prev. Activity Hrs	1300.00	0.00	0.00	1300.00
Reported Hr Subtotal	5511.38	1656.25	916.71	2938.42
% Distribution	100	30	17	53
% Distribution by EMS Type Hours Only		77	23	N/A

TABLE TWO

DIRECT COSTS ALLOCATED TO EMS SERVICES

Cost Description	Budget Alloc. Basis	Totals	Costs Allocated To: EMS Transport	1st Response
FY 98-99				
EMS Medical Supplies	Actual Expenditure	30020.21	27318.39	2701.82
Physician Services	Actual Expenditure	18000.00	16380.00	1620.00
EMS Coord./Off Assistant	Actual Expenditure	77793.96	70792.50	7001.46
EMS Trng/Schools/Travel	Actual Expenditure	8859.49	8062.14	797.35
EMS Equipment	Actual Expenditure	11201.09	10192.99	1008.10
EMS Veh. / Capital Deprec.	Book Depreciation	22000.00	20020.00	1980.00
EMS Capital Outlay	Actual Expenditure	52240.34	47629.71	4710.63
EMS Equipment Reserve	Actual Expenditure	65000.00	59150.00	5850.00
(Distribution %)		100%	91%	9%
Totals of 98-99 Direct EMS Cost Alloc.		285215.09	259545.73	25669.36
FY 99-00				
EMS Medical Supplies	Actual Expenditure	38473.00	29624.21	8848.79
Physician Services	Actual Expenditure	18000.00	13860.00	4140.00
EMS Coord./Off Assistant	Actual Expenditure	101102.00	78618.54	23483.46
EMS Trng/Schools/Travel	Actual Expenditure	12172.00	9372.44	2799.56
EMS Equipment	Actual Expenditure	11448.00	8814.96	2633.04
EMS Veh. / Capital Deprec.	Book Depreciation	36000.00	27720.00	8280.00
EMS Capital Outlay	Actual Expenditure	63943.00	49236.11	14706.89
EMS Equipment Reserve	Actual Expenditure	25000.00	19250.00	5750.00
(Distribution %)		100%	77%	23%
Totals of 98-99 Direct EMS Cost Alloc.		307138.00	236496.26	70641.74

TABLE THREE

INDIRECT COSTS ALLOCATED TO EMS SERVICES

FY 98-99

Cost Description	Budget Alloc. Basis	Totals	Cost Allocated To: EMS Transport	1st Response
Board of Directors	Actual Expenditure	7114.25	2276.56	924.85
Mgmnt. Staff Salaries	Actual Expenditure	228679.39	73177.40	29728.32
Line Staff Salaries	Actual Expenditure	416876.99	133400.64	54194.01
Insur./PERS/Unemployment	Actual Expenditure	156298.77	50015.61	20318.84
Materials and Services	Actual Expenditure	173173.18	55415.42	22512.51
Facilities Depreciation	Book Depreciation	66163.00	21172.16	8601.19
Staff Vehicle Depreciation	Book Depreciation	23371.00	7478.72	3038.23
Equipment Maint. & Fuel	Actual Expenditure	21009.02	6722.89	2731.17
Dispatch Services	Actual Expenditure	$ 54744.00	$ 17518.08	$ 7116.72
(Distribution %)		100%	32%	13%
Totals of 98-99 Indirect EMS Cost Alloc.		$ 1147429.00	$ 367177.47	$ 149165.84

FY 99-00

Board of Directors	Actual Expenditure	8536.00	2560.80	1451.12
Mgmnt. Staff Salaries	Actual Expenditure	276469.00	82940.70	46999.73
Line Staff Salaries	Actual Expenditure	419741.00	125922.30	71355.97
Insur./PERS/Unemployment	Actual Expenditure	269344.00	80803.20	45788.48
Materials and Services	Actual Expenditure	222945.00	66883.50	37900.65
Facilities Depreciation	Book Depreciation	84254.00	25276.20	14323.18
Staff Vehicle Depreciation	Book Depreciation	67471.00	20241.30	11470.07
Equipment Maint. & Fuel	Actual Expenditure	21071.00	6321.30	3582.07
Dispatch Services	Actual Expenditure	$ 68077.00	$ 20423.10	$ 11573.09
(Distribution %)		100%	30%	17%
Totals of 99-00 Indirect EMS Cost Alloc.		$ 1437908.00	$ 431372.40	$ 244444.36

TABLE FOUR

CANBY FIRE DISTRICT AMBULANCE COST PER UNIT HOUR

Unit I.D. (Veh. #) .	Fuel $	Maint. $	Insur. $	Deprec. $	Annual Hrs	Cost/Hour
FY 98-99						
Medic 62 (M3-99)	N/A	N/A	N/A	N/A	N/A	N/A
Medic 61 (M2-95)	1276.96	1004.45	595.00	12000.00	819.00	51.52
Squad 62 (M1-91)	146.78	645.31	576.00	10000.00	125.00	90.94
Average 98-99 Ambulance Cost/Unit Hour						**$ 71.23**
FY 99-00						
Medic 62 (M3-99)	2065.84	1032.67	642.00	14000.00	1007.00	$ 47.04
Medic 61 (M2-95)	146.65	77.88	573.00	12000.00	117.30	$ 109.10
Squad 62 (M1-91)	274.30	807.91	547.00	10000.00	222.00	$ 52.38
Average 99-00 Ambulance Cost/Unit Hour						**$ 69.51**
Average 98-00 Ambulance Cost/Unit Hour						**$ 70.20**

FY 99-00 AVG AMBULANCE COST/UNIT HR. W/ CREW APPLICATION

Career/Vol. Crew	Crew Cert. Profile	Crew Cost / Hr.	Amb. Cost / Hr	Total .
Career ALS	Lt./P & FF/P		69.51	
Career ALS	FF/P and FF/P		69.51	
Volunteer ALS	EMT -P & EMT-B	40.00	69.51	$ 109.51
Volunteer ILS	EMT-I & EMT-B	35.00	69.51	$ 104.51
Volunteer BLS	EMT-B & 1st Resp.	27.50	69.51	$ 97.01

TABLE FIVE

CANBY FIRE DISTRICT ACTUAL COST PER TRANSPORT

FY 98-99

A	=	Total EMS Transport Direct and Indirect Costs	=	$ 626723.20
B	=	Number of 98-99 Transports	=	521
X	=	Cost per EMS Transport (A /B)	=	$ 1202.92

FY 99-00

A	=	Total EMS Transport Direct and Indirect Costs	=	$ 667868.70
B	=	Number of 98-99 Transports	=	663
X	=	Cost per EMS Transport (A /B)	=	$ 1007.34